Additional Assessment Materials

Summer 2021

Pearson Edexcel GCE in As Mathematics

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Resource Set 1: Topic 4

Statistical distribution

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Additional Assessment Materials, Summer 2021

General guidance to Additional Assessment Materials for use in 2021

Context

- Additional Assessment Materials are being produced for GCSE, AS and A levels (with the exception of Art and Design).
- The Additional Assessment Materials presented in this booklet are an optional part of the range of evidence teachers may use when deciding on a candidate's grade.
- 2021 Additional Assessment Materials have been drawn from previous examination materials, namely past papers.
- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.

Purpose

- The purpose of this resource to provide qualification-specific sets/groups of questions covering the knowledge, skills and understanding relevant to this Pearson qualification.
- This document should be used in conjunction with the mapping guidance which will map content and/or skills covered within each set of questions.
- These materials are only intended to support the summer 2021 series.

1. A fair 5-sided spinner has sides numbered 1, 2, 3, 4 and 5

The spinner is spun once and the score of the side it lands on is recorded.

(*a*) Write down the name of the distribution that can be used to model the score of the side it lands on.

discrete uniform distribution **(1)**

The spinner is spun 28 times.

The random variable X represents the number of times the spinner lands on 2

(*b*) (i) Find the probability that the spinner lands on 2 at least 7 times.

$X \sim B(28, 1/5)$

(5)

$P(x \geqslant 7) = 1 - P(x \leqslant 6)$

$= 1 - 0.678443803 = 0.321556497$

≈ 0.322 (3sf)

(ii) Find $P(4 \leqslant X < 8)$

$P(x \geqslant 4) = 1 - P(x \leqslant 3)$

$P(x < 8) = P(x \leqslant 7)$

$\therefore P(x \leqslant 7) - P(x \leqslant 3)$

$= 0.818728027 - 0.160182671$

$= 0.658045608$

≈ 0.658 (3sf)

(Total for Question 1 is 6 marks)

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2. Afrika works in a call centre.

She assumes that calls are independent and knows, from past experience, that on each sales call that she makes there is a probability of $\frac{1}{6}$ that it is successful.

Afrika makes 9 sales calls.

(*a*) Calculate the probability that at least 3 of these sales calls will be successful. $X \sim B(9, 1/6)$

(2)

$P(x \geqslant 3) = 1 - P(x \leqslant 2)$

$= 1 - 0.821740457$

$= 0.178259543$

$= 0.178$ (3sf)

The probability of Afrika making a successful sales call is the same each day.

Afrika makes 9 sales calls on each of 5 different days.

(*b*) Calculate the probability that at least 3 of the sales calls will be successful on exactly 1 of these days.

$X \sim (5, 0.178\ldots)$

$P(X = 1) = 0.4064072873$

$= 0.406$ (3sf)

(2)

Rowan works in the same call centre as Afrika and believes he is a more successful salesperson.

To check Rowan's belief, Afrika monitors the next 35 sales calls Rowan makes and finds that 11 of the sales calls are successful.

(*c*) Stating your hypotheses clearly test, at the 5% level of significance, whether or not there is evidence to support Rowan's belief.

$H_0 : P = 1/6$

$H_1 : P > 1/6$

p is the probability of the call being successful

(4)

CRITICAL REGION

BINOMIAL CD $X \sim B(35, 1/6)$

TRIAL + IMPROVEMENT

$P(X \leq 10) = 0.97681\ldots$

$1 - 0.9768\ldots = 0.02319$

$P(X \leq 9) = 0.94499$

$1 - 0.9499 = 0.0501$

$0.051 > 0.025$

$\therefore$ CRITICAL REGION IS ≥ 10, SO 11 IS IN THE CRITICAL REGION.

$0.02319 < 0.025$

as it lies in the critical region there is sufficient evidence to reject H_0 and would suggest There is evidence to support Rowan's belief.

(Total for Question 2 is 8 marks)

3. A biased spinner can only land on one of the numbers 1, 2, 3 or 4. The random variable X represents the number that the spinner lands on after a single spin and $P(X = r) = P(X = r + 2)$ for $r = 1, 2$.

Given that $P(X = 2) = 0.35$,

(a) find the complete probability distribution of X.

(2)

r	1	2	3	4
$P(X = r)$	0.15	0.35	0.15	0.35

$1 - (0.35 \times 2)$

$= 1 - 0.7$

$= 0.3$

$0.3 / 2 = 0.15$

Ambroh spins the spinner 60 times.

(b) Find the probability that more than half of the spins land on the number 4. Give your answer to 3 significant figures.

(3)

$X \sim B(60, 0.35)$

$P(X > 30) = 1 - P(X \leq 30)$

$= 1 - 0.994110119$

$= 0.005889881 = 0.00589$ (3SF)

5.89×10^{-3} (3SF)

The random variable $Y = \dfrac{12}{X}$.

(c) Find $P(Y - X \leq 4)$.

(3)

$P\left(\frac{12}{x} - x \leq 4\right)$

$P(12 - x^2 \leq 4)$

$P(x^2 + 4x - 12 \geq 0) = P((x + 6)(x - 2) \geq 0)$

$P(x \geq 2) = 0.35 + 0.15 + 0.35 = 0.85$

$P(x \geq -6) =$ not possible

(Total for Question 3 is 8 marks)